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THREE REQUIREMENTS FOR THE ESTABLISHMENT OF VALID RESEARCH REQUIREMENTS

by Charles W. Hill

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THREE REQUIREMENTS FOR THE ESTABLISHMENT OF VALID RESEARCH REQUIREMENTS

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In this presentation I will attempt to demonstrate the importance of three requirements for the establishment of valid research requirements. Let me state them somewhat dogmatically and then I will attempt to justify them.

First, it is much simpler, more efficient, and more profitable for a separate research agency or system to maintain contact with and to determine requirements from the military operator or utilizer, than for the research agency or system to be an integral part of the operational command thereby receiving its requirements through direction and control.

Second, the most important single requirement that can be given by the military operator or utilizer to the research agency or system is the requirement to continuously conduct a comprehensive fundamental or basic research program in a certain scientific area; such as personnel psychology, educational psychology, psychophysiology, etc.

Parenthetically, although each of these first two propositions can be accepted or rejected on its own merits and demerits, there is a relationship between the two in that the greater extent to which the first proposition is accepted and employed, the less essential the second becomes and vice versa.

And third, research administrators at all levels, must translate requirements from the operational problem and question kind of thing into research hypothesis concepts and wordings and not just pass the requirements on as is, especially when located within a separate R & D system.

I do not believe that a specific definition of "research requirement" is of great importance to this symposium. At least, as far as being a point for discussion is concerned. To various people at various times, a requirement can be the objective of a research project, the reason for the project, the initial problem which led to the requirement, etc. The best operational definition depends on the particular time and place, with the overall definition, of course, including all these operations.

The most important function accomplished by the research requirement, I would submit, is that of establishing the authority for such-and-such an agency to engage in research of such-and-such a nature. In this respect, the requirement, regardless of its definition, is a key, a ticket, a license, a blessing and a defense. With an officially established requirement, money can be spent, personnel hired, facilities acquired - all integrated and oriented toward a certain scientific problem area. Without the requirement - well, these same activities can also be accomplished; but at much greater risk.

There are several serious difficulties almost inherently located in the process of transmutation from operational problem to researchable research requirements. First, there is the difficulty of problem recognition. The fact that one is experiencing trouble and even aware that something is wrong does not mean that the problem or problems can be specifically defined. Then, with the problem defined, there is the difficulty of overcoming inertia and finding the time and resources to begin to do something about it. If something is done, the form of that something is much more likely to be a staff study, a field test, or simply a direct change in policy or procedure. When and if the possibility of research is perceived, there are still numerous

entanglements pertaining to the precise formulation of the research hypothesis. At this stage, of course, the likelihood increases that research personnel may enter the situation to assist in the final development of the requirement.

The military operator, immersed in his practical, applied, every-day problems, cannot be expected to think with continuity and comprehensiveness, in terms of long-range basic research in areas denoted by the categories of science. His requirements are bound to be of the "quick-and-dirty" type with answers needed next week if not last week. He has problems, has always had problems and he is prepared to "solve" them with his own best resources if need be. If research people want to contribute, then, by gosh, they had better jump in and do it fast because time marches on. If the operator has to take time out and work up the requirements for the researcher, they will inevitably be simple statements of the most immediate and pressing problems.

Offsetting these disadvantages, one might well claim that at least the requirements are valid - generated as they are by the men with the military problems in the field. In fact, as I have implied above, many times they are actually direct statements of these problems. As they are based on the real problems, they must be valid requirements. I must confess that I would not be among the first to admit this, but will let it stand as an assumption for the remainder of this discussion. In addition to timely, meaningful requirements, the operator as research controller can provide ready and enthusiastic utilization for the research results. Having been instrumental in setting up the project, he eagerly waits for the product that will revolutionize his policies and procedures. Thus, the difficult and embarrassing chore of

product-selling is obviated, and incidentally, a friendly supporter is acquired for subsequent budget and program defenses.

From the foregoing, it would appear that whereas a separate, autonomous research system will afford maximum freedom and efficiency for the prosecution of research, an operator-controlled system will enhance the establishment of "valid" research requirements and facilitate the utilization of research results. Slide 1 illustrates this conflict of interest, and suggests the happy compromise - by presenting the research time cycle in its major three phases. I would now maintain that Stages 1 and 3 are best accomplished as the principal responsibility of operational military personnel, whereas Stage 2 is performed most successfully when completely free of operational influence. From this, I would conclude that organizations should be structured and responsibilities allocated in accordance with these three phases. For those who would worry about bridging the gaps and crossing the lines, I would further conclude that the advantages of an unrestricted research system far outweigh the disadvantages of an isolated research system. In other words, I believe that research people can adequately determine requirements and promote utilization through active liaison and positive coordination with their operational colleagues. (Slide 1 off)

Regardless of the organizational structure for R & D and the assignment of the various integral and supporting functions, a firm requirement for continuous fundamental research in certain fairly-well defined scientific areas should be established in accordance with whatever procedures the particular system requires, and reestablished at such times and in the manner prescribed

by the system for all requirements in general. This requirement I call the "basic charter" requirement, and I think it most important that it be processed as I have just described. Of course, it could be included in the mission, objectives, etc. of a laboratory, but I do not think it could play its important role as a permit, key or authority anywhere near as well unless it is also handled as a regular or normal requirement.

Now, I am not saying that laboratories should confine themselves only to these "basic charter" requirements. On the contrary, they must be so geared and operated that they can respond to applied problems with some sense of timeliness and be able to reorient emphasis or initiate action in a new sub-field to some reasonable extent as the occasion demands. Otherwise, there will be much unnecessary friction generated between the operational and the research people with accompanying mutual distrust and lack of support. The coordination and cooperation essential for the development of meaningful requirements and the proper utilization of research findings would then be impossible. However, I do maintain that the "basic charter" requirements are the most important and deserve the most concern - not only because the research conducted under the auspices of such requirements is by far the most likely to be sound, meaningful, and generalizable, but also because the applied requirements seem to take care of themselves. In other words, the more applied the requirements, the more you have to beat them off with a stick.

Slide 2 presents a model requirements ladder whose general characteristics might well be incorporated in all such systems. Three levels are

indicated, more or less arbitrarily, ranging from the fundamental "basic charter" for which I am pleading, to the ubiquitous "quick and dirty" which needs no support but grows like dandelions on the front lawn. With such a 3-level system in operation, requirements should be generated, processed and established continuously and/or periodically at all three levels. The same attention and effort should be directed at the lowest level as at the highest. The same authority and justification should be obtainable for the lowest level as for the highest. The golden spotlight beam must be spread over all three levels instead of being focused at the top.

With the "basic charter" accepted as an established requirement, a number of advantages will accrue. As I mentioned earlier, there is the increased likelihood that research conducted under such a requirement would be more sound, meaningful and capable of generalization. I do not believe this claim requires further elaboration. "Basic charter" research would also permit long-range planning and continuity of effort. It is this level which would determine the hiring of personnel and the purchase of costly research facilities. A virtual bonus would be the fact that a comprehensive research effort at the basic level would also be quite likely to provide solutions, as required, to the operational problems of Level 2 and ready answers to the quick and dirty questions of Level 3. (Slide 2 off)

At this time, I would like to make a brief diversion in order to take a critical look (or at least a "quick and dirty" look) at the perennial basic versus applied research controversy in the light of my preceding discussions. In the first place, I believe quite strongly that there is a meaningful distinction between these two kinds of research. The fact that they are the two ends of the same continuum does not mean that they cannot be operationally

separated. I think that the usual difficulty is created by the fact that the distinctions are sought at the wrong times and places within the research cycle. Once the research is underway and especially when it has produced its findings, I would agree that it is practically impossible to devise criteria which will distinguish between basic and applied. However, inspired by our 3-stage requirements model, I would now venture to suggest that one should look for the difference in the initiation stage of the research. The critical question is: how did the specific hypothesis become formulated? - or what influences determined the independent variables? In my biased opinion, the more the interests of the researcher himself determined the variables and formulated the hypothesis, the more basic is the research. And conversely, the greater the influence of outside factors such as applied problems to be solved and operational questions to be answered, the more applied that research would be.

After a research project has been completed, the results may be readily applicable or they may be completely abstract, regardless of the original intent of the research planners. This fact would not change the initial labeling of the research project and certainly would not negate the usefulness of this classification. The meaningfulness of the distinction, I would maintain, lies in the fact that, in the long run, "basic" research as I have defined it will produce a greater payoff than "applied" research in terms of general scientific coverage, generality and translatability of specific findings, and overall scientific advancement by means of the selective support of various hypotheses and theoretical areas.

Returning to the main stream of this presentation, let us look at the general or typical procedural system for the processing of requirements within a military service when the R & D system is relatively separate. Slide 3 shows the formulation of operational problems developing up through the field command hierarchy (on the left hand side). From the departmental staff the official statement of a problem requiring research is delivered to the top research level. (The problems involved up to this point have already been discussed).

I wish to focus attention now upon the descending communication channel (through R & D Channels) (at the right side of the slide). The easiest and I would venture to say the most common method for transmitting the problem or requirement down this chain is the "cover letter" or "pass the buck slip" method. After determining the most appropriate agency to handle the requirement, the statement is passed down with no change in content till it reaches the "grass roots" researchers who will conduct the required experimentation. This procedure, I would submit, is seriously in error and leads to several unfortunate consequences.

First, the original problem may require concurrent research by several agencies in order that a complete solution be achieved. Insuch a case, the requirement should be broken down into the appropriate components at each level within the R & D chain where the pertinent research component responsibilities would divide. Cross references, of course, must be established and coordination maintained to the end that a complete integration of research findings may eventually be accomplished.

Secondly, in many instances, complete or partial solutions to operational problems will already be on the shelf. The research has been accomplished and the conclusions are waiting patiently to be utilized. If requirements are automatically passed on down to the laboratory, much waster motion and time is expended before the proper text and page reference is identified. In addition, a complex problem might benefit from the integrated application of several "on the shelf" pieces of information, perhaps too diverse for any one laboratory to have recognized their combined significance.

A third disadvantage of the direct transmittal system is the increased burden that finally drops upon the shoulders of the "grass roots" researcher. He must cope with the strange language and unfamiliar concepts that were most likely employed by the original operators with a problem. He must attempt to understand the "big picture" view of the applied problem area with all of its connections and interweavings with the surrounding practical situation. Worst of all, the researcher must tease out and develop his specific hypotheses from scratch with little or no assistance from above toward the "boiling down" of information, the reworking of ideas and the focussing of attention that will always be necessary before a sound and respectable research task can be initiated. In accomplishing this huge task, the grass roots man is pulled out of his laboratory and forced up into the general arena of staff work and administration. This provides him with a liberal education but greatly reduces his scientific output. (Slide 3 off)

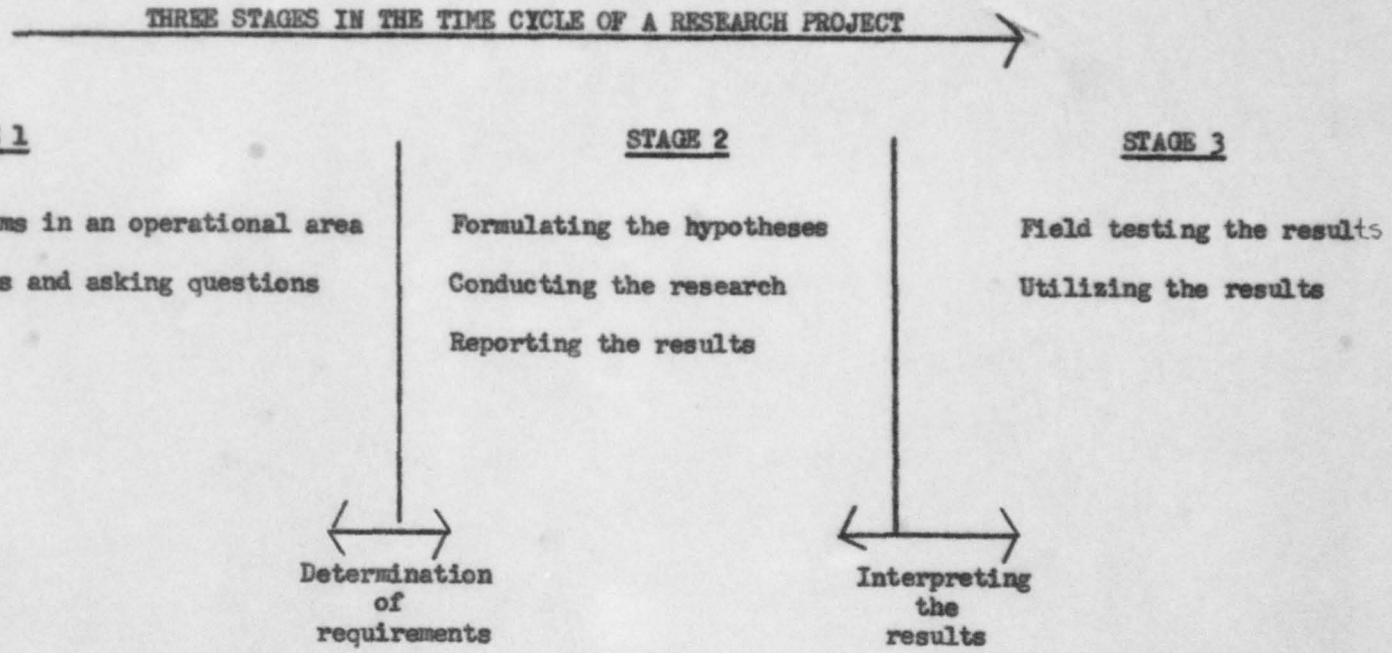
In summary, I will simply call again to your attention the three characteristics which I believe to be of greatest importance for the successful

functioning of a research requirements system in the military services.

First, the responsibility for the conducting of research should be centralized in a separate, autonomous agency which is receptive to, but not constrained by, the problems and requirements of the military operator.

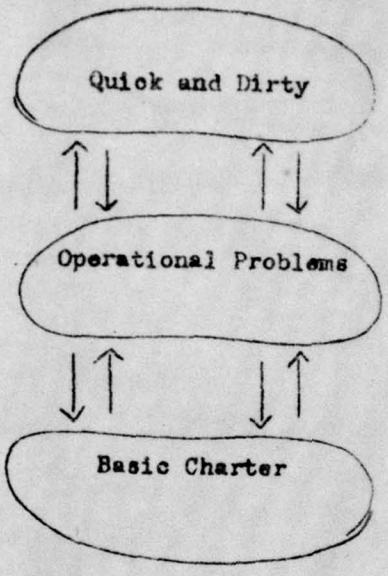
Second, the most valuable requirement to be established and maintained within any research system or agency is one calling for a continuous, comprehensive and fundamental research effort in specific scientific fields.

And third, research administrators at all levels must translate, not just transmit, the requirements they receive into more and more researchable hypotheses before passing them on down to the research laboratories for action.


THREE STAGES IN THE TIME CYCLE OF A RESEARCH PROJECT
STAGE 1
Experiencing problems in an operational area
Formulating problems and asking questions
STAGE 2
Formulating the hypotheses
Conducting the research
Reporting the results
STAGE 3
Field testing the results
Utilizing the results
Determination of requirements
Interpreting the results

THREE LEVELS FOR STATEMENTS OF REQUIREMENTS

LEVEL 3



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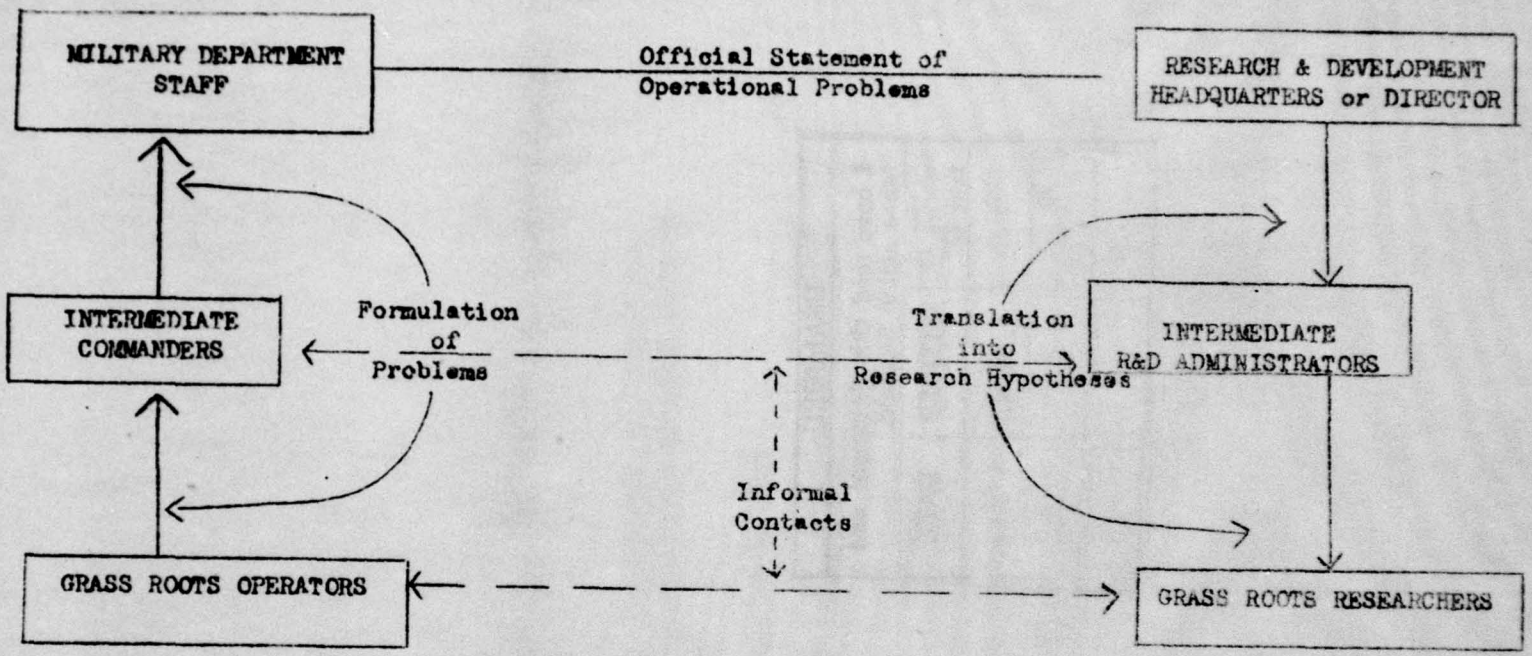
THE PROCESSING OF REQUIREMENTS



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